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VLADIMIROV, V.M., inzh., red.

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[Large-lot production of milling machines] Krupnoseriinoe proizvodstvo frezernykh stankov. Moskva, Mashinostroenie, 1965. 206 p. (MIRA 18:4)

RABKIN, A.L.; FEDOTENOK, A.A., prof., retsenzent; VLADIMIROV, V.M., inzh., red.

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VLADIMIROV, V. M.

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VLADIMIROV, V.M.; GULYAYEV, V.I.; ROGANOV, G.N., redaktor

[Appliances and mechanisms adapted to the work of invalids]
Prisposobleniia i mekhanizmy, oblegchayushchie trud invalidov.
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(DISABLED--REHABILITATION, ETC.)

DASHCHENKO, A.I., kand. tekhn.nauk; VLADIMIROV, V.M., inzh., ved. red.; APIRIN, B.S., inzh., red.; PONOMAREV, V.A., tekhn.red.

[Power heads for small semiautomatic machine-tool units]Silovye golovki malykh agregatnykh poluavtomatov. Moskva, Filial Vses. in-ta nauchn. i tekhn. informatsii, 1958. 75 p. (Peredovoi nauchno-tekhnicheskii i proizvodstvennyi opyt. Tema 10. No.M-58-59/11) (MIRA 16:2)

(Machine tools)

VLADIMIROV, V.M.

New technological processes and automatic equipment for finishing wooden articles. Biul.tekh.-ekon.inform.Gos.nauch.-issl. inst.nauch. i tekh.inform. 16 no.10:58-65 '63. (MIRA 16:11)

VLADIMIROV, V.N., inzh.

Automatic control of a hydraulic press. Avt. dor. 26 no.5:25 My '63. (MIRA 16:7)

(Hydraulic presses) (Automatic control)

BUDON, V.D.; POLYVYANNYY, I.R.; VLADIMIROV, V.P.

Effect of the rate of air suction on the process data obtained in sintering lead sulfide concentrates. Izv.AN Kazakh.SSR Ser.gor. dela, met.stroi.i strimat.no.9:53-61 '56. (MLRA 10:2)
(Lead--Metallurgy) (Sintering)

VLADIMIROV, V. P.

BUDON, V.D.; POLYVYANNYY, I.R.; VLADIMIROV, V.P.

Effect of charge column height on the process data obtaned in lead sulfide concentrates. Izv.AN Kazakh.SSR Ser.gor.dela, met.stroi.i stroimat.no.9:62-69 '56. (MLRA 10:2)

(Lead--Metallurgy) (Sintering)

VLADIMIROV, V.P., Cand Tech Sci -- (diss) "Certain heat ~~thermal~~ data on non-ferrous metallurgy slags." Alma-Ata, 1959. 20 pp with graphs (Acad of Sci KazSSR. Institute of Metallurgy and Concentration), 150 copies (KL,29-59, 128)

18(5) SOV/31-59-2-12/17

AUTHORS: Vladimirov, V.P. and Ponomarev, V.D.

TITLE: Heat Content and Smelting Temperatures of Slags of the SiO_2-FeO-CaO System (Teplosoderzhaniye i temperatury plavleniya shlakov sistemy SiO_2-FeO-CaO)

PERIODICAL: Vestnik Akademii nauk Kazakhskoy SSR, 1959, Nr 2, pp 100 - 106 (USSR)

ABSTRACT: This is a report on an experiment carried out to establish the smelting conditions and the heat content of slags of the triple system SiO_2-FeO-CaO. The slags of non-ferrous metallurgy are mostly lime and iron containing silicates. Generally, the total output of the system SiO_2-FeO-CaO represents 80 - 90% of the weight of the materials to be smelted. It is obvious, therefore, that the qualities of this system determine to a considerable degree the slag qualities of non-ferrous metallurgy. In order to prepare slags of the system SiO_2-FeO-CaO, the authors used the following materials: a synthetically pre-

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pared silicate containing 66.8% FeO, 6% Fe_2O_3, 1.0% Fe_{met} and 26.16% SiO_2, a purified rock crystal (99.95% SiO_2) and chemically pure calcium oxide. These materials mixed at an established ratio were molten in a Tammann furnace at a temperature of 1,300 ^oC. Roasting of the slags at a temperature of 950° permitted elimination of the cooling requirements, made on the degree of crystallization of the materials. It was possible to avoid thereby dropping the heat content magnitudes. The special method used in this case made it possible to characterize the process under its quantitative and qualitative aspects. The heat content of the slags was determined within a temperature interval of 200 - 1,250°. The roasting of the slags and the experiments were carried out in an argon atmosphere. Altogether, 40 synthetic slags were examined. The results of the investigation were the following: 1) The output of SiO_2-FeO-CaO slags smelted at temperatures up to 1250 ^oC varies within the limits: SiO_2- 30-60%, FeO 15-60%, CaO 8-30%; 2) the heat content of the slags below the

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Heat Content and Smelting Temperatures of Slags of the SiO_2-FeO-CaO System

temperature of their first melting phase obeys the law of additivity; 3) the heat content of the molten slags changes at a temperature of 1,250° C from 340 to 400 cal/g, depending on their chemical composition; calcium oxide has the greatest influence on increased heat content; 4) the initial and final temperatures of the smelting process have been established; isotherms connecting the full melting points of the slag components have been plotted on a triangular graph; 5) the possibility of using the heat current method for a simultaneous determination of the heat content, the initial and final smelting temperatures and also the melting heat of the substances, shows its advantage over other methods; 6) the obtained graphs (heat content and viscosity) permit singling out a section of the triangle, where the slags have a comparatively low melting temperature (1,000 - 1,150°) and a respectively low heat content (340-380 cal/g); the output of these slags

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Heat Content and Smelting Temperatures of Slags of the SiO_2-FeO-CaO System

varies within the following limits: SiO_2 - 35-53%, FeO - 30-55%, CaO - 7-25%; 7) the results obtained with regard to the **fusibility** and heat content of slags of the triple system permit selection of the most suitable slag composition under production conditions. In the article the following scientists are mentioned: Kh.K. Avetisyan, Professor I.M. Rafalovich, B.P. Selivanov. There are 6 graphs and 5 Soviet references.

Card 4/4

SHUROVSKIY, V.G.; VLADIMIROV, V.P.; GNATYSHENKO, G.I.; KUROCHKIN, A.F.; SHCHUROVSKIY, Yu.A.; ADSON, N.I.; GOLOVKO, V.V.

Some physicochemical properties of charges for and the products of the electric smelting of Dzhezkazgan copper concentrates. Izv.AN Kazakh.SSR.Ser.met., obog.i ogneup. no.1:8-13 '61. (MIRA 14:6)
(Dzhezkazgan—Copper—Electrometallurgy)

VLADIMIROV, V.P.

POLYVYANNYY, I.R.; VLADIMIROV, V.P.

Studying the rate of oxidation of lead sulfide concentrates. Izv.AN Kazakh.SSR.Ser.gor.dela met., stroi. i stroimat. no.4:109-124 '57. (MIRA 11:4)

(Lead sulfide--Metallurgy) (Oxidation)

SOV/137-58-7-14079

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 7, p 14 (USSR)

AUTHORS: Polyvyannyy, I. R., Vladimirov, V. P.

TITLE: A Study of the Rate of Oxidation of Lead Sulfide Concentrates (Izucheniye skorosti okisleniya sul'fidnykh svintsovykh kontsentratov)

PERIODICAL: Izv. AN KazSSR. Ser. gorn. dela, metallurgii, str-va i stroymaterialov, 1957, Nr 4 (15), pp 109-124

ABSTRACT: The object of the investigation is to study the overall oxidation rate (OR) of Pb-sulfide concentrates, and also the OR of individual sulfides in these concentrates in accordance with the temperature, duration, and chemical and mineralogical composition of the concentrates. When the concentrates are roasted under conditions of gradually rising temperature, SO_2 is found to appear at 295-310°C, depending on the content of the readily inflammable Fe and Cu sulfides. The OR-versus-temperature curves reveal three maxima corresponding to fully defined periods of sulfide oxidation. As the temperature is increased (to 550-900°C), the maximum OR rises sharply during the first 15 min. Thus, the time OR of concentrates presents a

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A Study of the Rate of Oxidation of Lead Sulfide Concentrates

maximum at 550°, yet at 700° it becomes considerably higher and begins to vary on a descending curve. At 550-700° the degree of oxidation is determined mainly by the OR of Fe and Cu sulfides. The degree of desulfurization in 15 min at these temperatures is, depending upon the composition of the concentrate, 52-72%. The effect of individual sulfides is felt at these same temperatures. At 700°C, partial fusion and sintering of the concentrates begins. At 850, 900, and 1000° the total OR is determined by the conditions of diffusion. As temperature rises from 850 to 1000° it increases, the concentrates with the higher galena and pyrite contents having higher OR maximums than those with higher Zn contents. Simultaneously there is an increase in resistance to diffusion, and this results in lower rate values and a decrease in the overall time OR. The OR is affected by the influence of the chemical and mineralogical composition of the concentrates. Thus, at low temperatures, the gangue rock acts as a catalyst, while at high temperatures it inhibits OR. An investigation of the phase transformations shows that Pb and Zn oxides are the fundamental forms in the products of roasting of the concentrates. Rise in temperature carries with it a rise in the amount of Pb and Zn oxides; the higher the temperature, the higher the quantity of bound oxides. 1. Lead sulfides--Oxidation 2. Lead sulfides--Temperature factors 1. Lead sulfides--Sintering

A. Sh.

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VLADIMIROV, V.P.; PONOMAREV, V.D.

Some thermal data on the system SiO_2--FeO--CaO. Vest. AN Kazakh. SSR 15 no.4:73-77 Ap '59. (MIRA 12:7)
(Slag) (Manganese oxide) (Vanadium oxide)

VLADIMIROV, V.P.

BUDON, V.D.; POLYVYANNYY, I.R.; VLADIMIROV, V.P.

Effect of particle size and charge preparation techniques on the process data obtained in sintering lead sulfide concentrates. Izv. AN Kazakh.SSR.Ser.gor.dela, met., stroi.i stroimat.no.9:70-79 '56.
(Lead--Metallurgy) (Sintering) (MLRA 10:2)

SOV/137-58-9-18439

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 36 (USSR)

AUTHORS: Polyvyannyy, I. R., Solov'yeva, V. D., Vladimirov, V. P.

TITLE: Investigation of the Rate of Interaction of Sulfides of Lead and Zinc with Silicates and Ferrites of Lead and Silicate of Iron (Issledovaniye skorosti vzaimodeystviya sul'fidov svintsa i tskinka s silikatami i ferritami svintsa i silikatom zheleza)

PERIODICAL: Izv. AN KazSSR, Ser. gorn. dela, metallurgii, str-va i stroymaterialov, 1957, Nr 5 (16), pp 86-103

ABSTRACT: The reactions of PbS and ZnS with $PbO \cdot SiO_2$, $2PbO \cdot SiO_2$, $PbO \cdot Fe_2O_3$, and $FeO \cdot SiO_2$ were investigated in the 600 - 1200°C temperature range in a current of N_2. It is demonstrated that with an increase in temperature to 1050° the reactions are speeded up. The curves of the rate of these reactions have a clearly expressed maximum. The interaction of PbS and ZnS with the monosilicate proceeds more completely and the rate of the summary reaction is higher than that with the bisilicate. An increase in temperature to 1200° reduces the rate of the reaction owing to a considerable volatilization of sulfides and a partial sintering of the material. In the case of the

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SOV/137-58-9-18439

Investigation of the Rate of Interaction of Sulfides (cont.)

interaction of Pb silicates with PbS, the main products of the reaction are Pb, SiO_2, and SO_2. The interaction of Pb silicates and ZnS proceeds according to the reaction of double decomposition (exchange reaction) with the formation of Zn silicates and PbS. The rate of the interaction of PbS with Pb ferrite is higher than with its silicates. At 1000° the reaction is 99% complete in 60 min. The reaction of ZnS with $PbO \cdot Fe_2O_3$ at the maximum temperature is only 30% complete. The rate of reaction of PbS with fayalite is very low. In one hour at 1200° the reaction is only 8.4% complete. There is practically no reaction between ZnS with $FeO \cdot SiO_2$. The low rates of the reactions indicated point to the fact that they have no decisive value in a sintering roasting.

G. F.

1. Lead sulfide--Chemical reactions 2. Zinc sulfide--Chemical reactions 3. Iron silicates--Chemical reactions 4. Lead silicates--Chemical reactions

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VLADIMIROV, V.P.; SMIRNOV, V.I.

Heat content and the fusion temperature of slags in shaft furnace lead smelting. Izv.AN Kazakh.SSR.Ser.met,obog.i ogneup. no.1:34-39 '59. (MIRA 13:4)
(Slag--Thermal properties) (Smelting furnaces)

VLADIMIROV, V.P.

Determination of the thermal properties of metallurgical materials.
Vest. AN Kazakh. SSR 14 no.4:49-55 Ap '58. (MIRA 11:6)
(Metallurgy)

VLADIMIROV, V.P.

Investigating the agglomeration roasting of sulfide lead concentrates with air blowing from bottom up. Trudy Inst. met. i obogashch. AN Kazakh. SSR 2:58-63 '60. (MIRA 13:10)
(Ore dressing) (Lead--Metallurgy)

VLADIMIROV, V.P.; POLYVYANNYY, I.R.; SHCHUROVSKIY, Yu.A.

Some data on the enthalphy of alloys of the quaternary system Cu_2S - FeS - ZnS - Na_2S. Vest. AN Kazakh.SSR 19 no.2:21-29 F '63. (MIRA 16:5)

(Enthalpy) (Systems (Chemistry))

VLADIMIROV, V.S.

Calculating and defining the characteristics of the asynchronous operation of a single-phase salient-pole synchronous motor. Vop. elek.zhel.dor. no.1:194-201 '59. (MIRA 12:8)
(Electric railroads--Motors)

VLADIMIROV, V.S. (Moskva)

Application of the properties of holomorphic domains to differential equations. Studia math Ser spec no.1:133-135 '63.

VLADIMIROV, V.S.

Problem of the linear adjunction of holomorphic functions of several complex variables. Izv. AN SSSR. Ser. mat. 29 no.4: 807-834 '65. (MIRA 18:9)

VLADIMIROV, V.S.

Plurisubharmonic functions in tubular radial regions. Izv. AN SSSR. Ser. mat. 29 no.5:1123-1146 '65. (MIRA 18:10)

VLADIMIROV, V. S.

CARD 1/3 PG - 48

SUBJECT USSR/MATHEMATICS/Differential equations
AUTHOR WLADIMIROV W.S.
TITLE Approximative solution of a boundary value problem for a differential equation of second order.
PERIODICAL Prikled. Mat. Mech. 19, 315-324 (1955) reviwed 5/1956

In the interval (0,1) the differential equation

(1) $$y'' - p(x)y = - f(x)$$

with the boundary conditions

(2) $$y'(0) - H_1 y(0) = y'(1) + H_2 y(1) = 0 \qquad (0 \leq H_1,\ H_2 \leq +\infty)$$

is considered. The functions $p(x)$ and $f(x)$ are supposed to be integrable on (0,1), and almost everywhere on (0,1) $p(x) \geq p_0 > 0$ is assumed. If L and C denote the functional spaces of the integrable and continuous functions, respectively, on (0,1), then the required function $y(x)$ ($y \in C$, $y' \in C$, $y'' \in L$) is to satisfy the following conditions:

1) $y'(x)$ is to be absolutely continuous on (0,1),
2) equation (1) is to be valid almost everywhere on (0,1),
3) $y(x)$, $y'(x)$ is to satisfy the boundary conditions (2).

By decomposition of the differential operator of second order into the product of two differential operators of first order (1) is transformed into the equivalent system

Priklad. Mat. Mech. 19, 315-324 (1955)

$$(3)\quad \begin{aligned} q' + g(x)q &= f(x), \\ y' - g(x)y &= -q(x), \end{aligned}$$

where $g(x)$ is the solution of the Riccati equation $g' + g^2 = p(x)$. The absolutely continuous solutions of (3) which satisfy the conditions $g(0) = H_1$, $q(0) = 0$, $y(1) = q(1)/g(1) + H_2$ evidently give the solution of the starting problem:

$$q(x) = \int_0^x f(x') \exp(-\int_{x'}^x g(t)dt)\, dx',$$

$$y(x) = \frac{q(1)}{g(1)+H_2} \exp(-\int_x^1 g(t)dt) + \int_x^1 q(x') \exp(-\int_x^{x'} g(t)dt)\, dx'.$$

Now these integral representations are employed in order to obtain an approximative solution of (1). Thereby as approximative solution of (1) the solution of the equation

$$Y'' - P_{h_1,\dots,h_n}(x)Y = - f_{h_1,\dots,h_n}(x)$$

with boundary condition (2) is understood. Here it is denoted

Priklad. Mat. Mech. 19, 315-324 (1955) CARD 3/3 PG - 48

$$p_{h_1,\dots,h_n}(x) = p_i = \frac{1}{h_i}\int_{x_{i-1}}^{x_i} p(x)\,dx,$$

$$f_{h_1,\dots,h_n}(x) = f_i = \frac{1}{h_i}\int_{x_{i-1}}^{x_i} f(x)\,dx \qquad (x_{i-1} < x < x_i)$$

with $h_i = x_i - x_{i-1}$, $0 = x_0 < x_1 < \dots < x_{n-1} < x_n = 1$. The p_i, f_i are evidently piecewise constant, hence solutions in the intervals (x_{i-1}, x_i) are to be found.

By means of several lemmas on numerous rather complicated estimations the author then proves the uniform convergence of $Y(x)$, $Y'(x)$ to $y(x)$; $y'(x)$ if max h_i tends to 0. $Y''(x)$ converges to $y''(x)$ in the mean. Furthermore the stability of the solution against accidental errors is proved. This follows from the fact that $g(x)$ is positive on $(0,1)$. The exactness of the proposed method is demonstrated by two examples. E.g. for the equation $y'' - \frac{2}{x^2}y = \frac{1}{x}$, $y(2)=y(3)=0$ the author obtains $y(2,2)=0,03254$ and $Y(2,2)=0,03257$. However, according to the given estimation the error is less than 0,0125.

VLADIMIROV, V.S. (Moskva).

Application of the Monte Carlo methods for obtaining the lower characteristics number and the corresponding eigenfunction for a linear integral equation [with summary in English]. Teor.veroiat.i ee prim. no.1:113-130 '56. (MLRA 9:12)

(Probabilities) (Integral equations)

VLADIMIROV, V.S.

KERTISS, D. [Curtiss, J.H.]; VLADIMIROV, V.S. [translator].

Monte Carlo methods for the iteration of linear operators. Translated from English by V.S. Vladimirov. Usp. mat. nauk 12 no.5:149-174 S-O '57. (MIRA 10:11)

(Operators (Mathematics)) (Sampling (Statistics))

VLADIMIROV, V. S.

PA - 2362

AUTHOR: WLADIMIROW, W.S.

TITLE: On an Integro-Differential Equation. (Ob odnom integro differenzialnom urawnenii, Russian).

PERIODICAL: Izvestiia Akad. Nauk SSSR, Ser. Mat., 1957, Vol 21, Nr 1, pp 3 -52 (U.S.S.R.).
Received: 4 / 1957 Reviewed: 5 / 1957

Abstract: Here the linear integro-differential equation of transfer is dealt with. The theorem of the existence of uniqueness and the fact of the existence of a permanent dependence of the solution on the coefficients of the right side of the equation are confirmed. Furthermore, the properties of the eigenvalues and eigenfunctions are determined which refer to a corresponding unique task. The coincidence of the method of successive approximations and also the new variation principle are proved, and the latter's argumentation is explained.

As a starting point the determination of a linear integro-differential equation $\frac{1}{a(P)}(s, \mathrm{grad}\varphi) + \varphi = \lambda b(P)\int_{\Omega} \varphi(s,P)ds + F(s,P)$ concerning an unknown function $\varphi(s,P)$, is chosen, which is dependent on the point P of the determined manifold G of the n-fold Euclidian space R_n and the directions in R_n. This equation with the corresponding boundary conditions occurs in the theory on the steady

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On an Integro-Differential Equation.

monoenergetic and isotropic processes of the transfer, to which belong e.g. the phenomena of the transmission of radiation energy and the diffusion of neutrons.

The paper consists of 8 paragraphs which are entitled as follows: 1) Setting of the task. 2) Properties of the operators S and L. 3) Transformation of the task into Peyerls' integral equation. 4) Solution of Peyerls' integral equation, 5) Properties of the integro-differential equation. 6) The method of successive approximation. 7) Construction of the task in the self-consistent manner. 8) Variation principles for the integro-differential equation.

The following publications are cited: Tschandrasekar, Feinberg, Sax, Riss and Sekefalvi-Nad, Peyerls, Fuchs, Petrowskiy, Michlin, Sobolew, Krein and Ruthmann, Solomiak, Kantorowitsch, Kellog, and Lusternik).

ASOCIATION: Not given.

PRESENTED BY:

SUBMITTED:

AVAILABLE: Library of Congress.

Card 2/2

VLADIMIROV, V. S.

38-5-5/6

AUTHOR: VLADIMIROV, V.S.

TITLE: On the Integro-Differential Equation for the Transmission of Particles (Ob integro-differentsial'nom uravnenii perenosa chastits).

PERIODICAL: Izvestiya Akad.Nauk,Ser.Mat.,1957,Vol.21,Nr 5,pp.681-710(USSR)

ABSTRACT: A stationary monoenergetic particle transmission (transmission of radiant energy in the atmosphere, diffusion of neutrons etc.), as it is well-known, is described by the linear integro-differential equation

$$(1) \quad \frac{1}{a(P)}(s, \operatorname{grad}\varphi) + \varphi = \lambda \int_{\Omega} \theta(P,s,s')\varphi(s',P)ds' + F(s,P)$$

where the unknown function $\varphi(s,P)$ describes the density of particles flying out from a given point $P(x_1,x_2,\ldots,x_n)$ into a given direction $s = (s_1,s_2,\ldots s_n, \sum_{i=1}^{n} s_i^2 = 1)$. In the special case $\theta(P,s,s') = b(P)$ the author investigated (1) in a former paper (Izvestiia Akad.Nauk 21, 3-52, 1957). In the present paper the author applies his preceding results in order to obtain an explicit mathematical theory of the

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On the Integro-Differential Equation for the Transmission of Particles

equation (1). Under numerous presuppositions on the functions a, Θ and F there are proved 5 theorems on the whole and several corollaries.

ASSOCIATION: Math. Inst. im. V.A. Steklov, USSR Acad. Sc. (Matematicheskiy institut im. V.A. Steklova, AN SSSR)

PRESENTED: By V.T. Smirnov, Academician

SUBMITTED: February 21, 1957

AVAILABLE: Library of Congress

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VLADIMIROV, V.S.

16(0);28(2) p.2 PHASE I BOOK EXPLOITATION SOV/3366

Akademiya nauk SSSR. Vychislitel'nyy tsentr

Vychislitel'naya matematika; sbornik 3 (Mathematics of Computation; Collection of Articles, Nr 3) Moscow, Izd-vo AN SSSR, 1958. 189 p. Errata slip inserted. 5,000 copies printed.

Resp. Ed.: A. A. Abramov, Candidate of Physical and Mathematical Sciences; Ed.: M. V. Yakovkin; Tech. Ed.: T. P. Polenova.

PURPOSE: This book is intended for applied mathematicians, scientists, and engineers whose work involves computation.

COVERAGE: This book contains 9 articles on computational techniques. The subjects considered include: numerical solutions of the kinetic equation for a sphere; approximate method of solving the Hilbert and Poincaré problem; solution of the Laplace equation in a region within the interior of an ellipsoid; calculating the flow around an arbitrary profile and solid of revolution in a

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subsonic gas flow (symmetric case); calculating annular supersonic nozzles and diffusers; calculating the lowest characteristic number of Peierls' equation by the Monte Carlo method; study of the oscillation of beams of constant cross section by means of balance type integral equations; calculation of the flow around a circular cylinder with detached shock wave; and new routines for computing finite differences on computers. References accompany each article.

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Mathematics of Computation (Cont.)

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16(1) SOV/155-58-3-6/37

AUTHORS: Bogolyubov, N.N., and Vladimirov, V.S.

TITLE: A Theorem of the Analytic Continuation of Generalized Functions (Odna teorema ob analiticheskom prodolzhenii obobshchennykh funktsiy)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1958, Nr 3, pp 26-35 (USSR)

ABSTRACT: Let $x,\zeta,p\dots$ be the points $(x_o,x_1,\dots x_n)$, $(\zeta_o,\zeta_1,\dots\zeta_n)$, while $\vec{x}=(x_1,\dots,x_n)$, so that $x=(x_o,\vec{x})\dots$. Let $x\zeta = x_o\zeta_o - \vec{x}\vec{\zeta}$, $x^2 = x_o^2-\vec{x}^2$ etc. Let S be a space of functions differentiable at infinity which together with their derivatives vanish in infinity quicker than $(x_o^2-\vec{x}^2)^{-N}$, $N>0$. A linear continuous functional over S is understood as a generalized function.

Theorem: Let the generalized function $F_r(x)$, $F_a(x)$ vanish for $x_o<0$ and $x^2<0$ respectively or for $x_o>0$ and $x^2<0$ respectively. Let their Fourier transforms

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A Theorem of the Analytic Continuation of Generalized Functions

$$\tilde{F}_j(p) = \int F_j(x) e^{ipx} dx, \quad dx = dx_0\, dx_1 \ldots dx_n, \quad j = r, a$$

be identical in

(1) $p^2 < m$.

Then there exists an integral $N > 0$ so that in (1) it holds:

$$\tilde{F}_r(p) = \tilde{F}_a(p) = \sum_{k=0}^{N} P_k(p)\, \phi_k(p^2),$$

where $P_k(p)$ are polynomials and the functions $\phi_k(\xi)$ can be continued analytically in the whole complex w-plane with the exception of the cut

(2) $\mathrm{Im}\, w = 0$, $\mathrm{Re}\, w \geqslant m$.

Besides the $\phi_k(w)$ in all points w being distant more than $\delta > 0$

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A Theorem of the Analytic Continuation of Generalized Functions

from the cut (2) are bounded by a polynomial the degree of which does not depend on δ.

The author mentions S.L.Sobolev, and K.I.Babenko.

There are 11 references, 4 of which are Soviet, 2 French, 1 Italian, 2 American, and 2 Swedish.

ASSOCIATION: Matematicheskiy institut imeni V.A.Steklova AN SSSR (Mathematical Institute iemni V.A.Steklov, AS USSR)

SUBMITTED: April 16, 1958

Card 3/3

68022

SOV/155-58-6-23/36

~~16(1)~~ 16.4500

AUTHOR: Vladimirov, V.S.

TITLE: On an Integral Equation Which is Connected With Spherical Functions

PERIODICAL: Nauchnyye doklady vysshey shkoly, Fiziko-matematicheskiye nauki, 1958, Nr 6, pp 142-146 (USSR)

ABSTRACT: Let s and s' be points of the unit hypersphere Ω, $\mu = s \cdot s'$ the cosine of the angle between the directions s and s'. In [Ref 1] - [Ref 7] it is stated under different suppositions on the function $K(\mu)$ that the eigen values of the integral equation

$$(1) \qquad \int_{\Omega} K(\mu)\varphi(s')ds' = \lambda \cdot \varphi(s)$$

are connected in a certain way with the hyperspherical functions. In the present paper this connection is extended to the case, where $K(\mu)$ is only assumed to be summable according to Lebesgue.

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On an Integral Equation Which is Connected With Spherical Functions SOV/155-58-6-23/36

There are 9 references, 1 of which is Soviet, 1 American, 4 Hungarian, and 3 German.

AN SSSR

ASSOCIATION: Matematicheskiy institut imeni V.A. Steklova (Mathematical Institute imeni V.A. Steklov AS USSR)

SUBMITTED: June 20, 1957 (Uspekhi matematicheskikh nauk)
October 24, 1958 (Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki)

Card 2/2

VLADIMIROV, V.S.

38-22-1-2/6

AUTHOR: Bogolyubov, N.N. and Vladimirov, V.S.

TITLE: On the Analytic Continuation of Generalized Functions (Ob analiticheskom prodolzhenii obobshchennykh funktsiy)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, 1958, Vol. 22, Nr 1, pp 15-48 (USSR)

ABSTRACT: For generalized functions $F_r(x)$ and $F_a(x)$ which vanish for $x \lesssim 0$ and $x \gtrsim 0$ resp., and the Fourier transforms $\widetilde{F}_r(p)$ and $\widetilde{F}_a(p)$ of which are equal in a certain domain G^o, the authors prove the existence of a function of the complex variables $k_o, \dots, k_3$ which is analytic in the domain G and is identical with $\widetilde{F}_r(p)$, $\widetilde{F}_a(p)$ for real $p \in G^o$. This general continuation theorem for generalized functions of several variables is needed in the proof of the fundamental theorem: Let translation-invariant generalized functions of four vectors

$$F^{\nu}_{ij}(x_1, x_2, x_3, x_4) \quad i,j = r,a \quad , \quad \nu = 1,2,\dots,1$$

be given.

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On the Analytic Continuation of Generalized Functions 38-22-1-2/6

Under transformations L from the full Lorentz group let these functions transform linearly with the aid of a certain representation A(L) :

$$F^{\nu}_{ij}(Lx_1, \ldots, Lx_4) = \sum_{1 \leqslant \nu' \leqslant 1} A_{\nu,\nu'}(L)\, F^{\nu'}_{ij}(x_1, \ldots, x_4)$$

Furthermore these functions are assumed to satisfy the following conditions:

$$F^{\nu}_{rr} = 0 \quad \text{for} \quad x_1 \lesssim x_3 \quad \text{or} \quad x_2 \lesssim x_4$$

$$F^{\nu}_{ra} = 0 \quad \text{for} \quad x_1 \lesssim x_3 \quad \text{or} \quad x_2 \gtrsim x_4$$

$$F^{\nu}_{ar} = 0 \quad \text{for} \quad x_1 \gtrsim x_3 \quad \text{or} \quad x_2 \lesssim x_4$$

$$F^{\nu}_{aa} = 0 \quad \text{for} \quad x_1 \gtrsim x_3 \quad \text{or} \quad x_2 \gtrsim x_4$$

The Fourier transformation

$$\int F^{\nu}_{ij}(x_1,\ldots,x_4)\exp i(p_1x_1+\ldots+p_4x_4)dx_1\ldots dx_4 = \delta(p_1+\ldots+p_4)\tilde{F}^{\nu}_{ij}(p_1\ldots p_4)$$

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38-22-1-2/6

On the Analytic Continuation of Generalized Functions

is considered, where $\widetilde{F}_{ij}^{\nu}(p_1,\dots,p_4)$ are generalized functions of $(p_1,\dots,p_4)$ defined on the manifold $p_1 + \dots + p_4 = 0$. Let the following conditions be satisfied:

$$\widetilde{F}_{rj}^{\nu} - \widetilde{F}_{aj}^{\nu} = 0 \quad \text{for } p_1^2 < (M+\mu)^2, \; p_3^2 < G\mu^2, \quad j = r, a$$

$$\widetilde{F}_{ir}^{\nu} - \widetilde{F}_{ia}^{\nu} = 0 \quad \text{for } p_2^2 < (M+\mu)^2, \; p_4^2 < G\mu^2, \quad i = r, a$$

$$\widetilde{F}_{ij}^{\nu} = 0, \text{ if } (p_1+p_3)^2 < (M+\mu)^2 \quad \text{or} \quad p_{10} + p_{30} < 0, \text{ where } M > 2\mu > 0.$$

Then generalized functions $\widetilde{\Phi}_{\lambda}(z,\xi)$ of the real variable ξ can be constructed with the following properties:

1. $\Phi_{\lambda}(z,\xi)$ are analytic in $z = (z_1,\dots,z_5)$ in the domain

$$|z_1 - M^2| \leqslant \varrho\mu^2, \quad |z_2 - M^2| \leqslant \varrho\mu^2, \quad |z_3 - \tau| \leqslant \varrho\mu^2, \qquad (1)$$

$$|z_4 - \tau| \leqslant \varrho\mu^2, \quad |z_5 + \alpha^2| < \varrho^2\mu^2\left(\frac{M}{t}\right)^2, \quad \nu \leqslant \tau \leqslant \mu^2,$$

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On the Analytic Continuation of Generalized Functions 38-22-1-2/6

$0 \leqslant \lambda \leqslant 2\sqrt{2}\mu$

2. $\widetilde{\phi}_\lambda(z, \xi) = 0$, if $\xi < (\frac{M+\mu}{2})^2$

3. for real $(p_1 \cdot\cdot p_4)$, $p_1 + \cdot\cdot + p_4 = 0$ for which the magnitudes $z_1 = p_1^2$, $z_2 = p_2^2$, $z_3 = p_3^2$, $z_4 = p_4^2$, $z_5 = (p_1 + p_2)^2$ satisfy the conditions (1), and for $\xi = (\frac{p_1+p_3}{2})^2$ it holds for $p_{10} + p_{30} > 0$ the representation

$$\widetilde{F}^{\nu}_{ij}(p_1, \ldots, p_4) = \sum p_{i_1}^{\alpha_1} \ldots p_{i_s}^{\alpha_s} \widetilde{\phi}_\lambda(z, \xi)$$

with a finite number of terms in the sum. This theorem can be applied in theoretical physics to the establishment of dispersion relations [Ref 1,2] . There are 13 references, 8 of which are Soviet, 3 French, and 2 English.

Card 4/5

On the Analytic Continuation of Generalized Functions 38-22-1-2/6

ASSOCIATION: Matematicheskiy institut imeni V.A. Steklova Akademii nauk SSSR (Mathematical Institute imeni V.A. Steklov, Academy of Sciences, USSR)

SUBMITTED: June 17, 1957

AVAILABLE: Library of Congress

1. Functions-Analysis 2. Fouriers series-Applications

Card 5/5

SOV/38-22-4-2/6

AUTHOR: Vladimirov, V.S.

TITLE: On the Equation for the Transmission of Particles (Ob uravnenii perenosa chastits)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya matematicheskaya, 1958, Vol 22, Nr 4, pp 475-490 (USSR)

ABSTRACT: The equation

$$(1)\quad \frac{1}{a(P)}(s,\operatorname{grad}\varphi)+\varphi=\lambda\int_{\Omega}\Theta(P,s,s')\varphi(s',P)\,ds'+F(s,P)$$

already considered by the author several times [Ref 1,2] is now investigated under the assumption that F belongs to the space $\mathcal{G}_p$, $p\geqslant 1$ of the complex functions, the absolute value of which is summable on $\Omega\times G$ in p-th power with the weight a(P). Here it is

$$\|F\|_p=\left\{\int_{\Omega\times G} a(P)|F(s,P)|^p\,ds\,d\,P\right\}^{1/p},\quad F\in\mathcal{G}_p\quad,\ p<\infty$$

$$\|F\|_\infty=\sup_{(s,P)\in\Omega\times G}\text{vrai}\,|F(s,P)|\ ,\quad F\in\mathcal{G}_\infty\ .$$

Card 1/2

All notations are taken from [1] and [2] . In the present paper the correctness of the Riesz - Schauder - Radon theory is proved for (1).
There are 10 references, 7 of which are Soviet, and 3 American.

ASSOCIATION: Matematicheskiy institut imeni V.A.Steklova Akademii nauk SSSR (Mathematical Institute imeni V.A.Steklov of the Academy of Sciences of the USSR)

PRESENTED: by N.N. Bogolyubov, Academician

SUBMITTED: September 12, 1957

1. Particles—Transmission 2. Mathematics

39-44-2-8/10

AUTHOR: Vladimirov, 7.S. (Moscow)

TITLE: On Perfect Forms With 6 Variables (O sovershennykh formakh s shest'yu peremennymi)

PERIODICAL: Matematicheskiy Sbornik, 1958, Vol 44, Nr 2, pp 263-272 (USSR)

ABSTRACT: The positive-definite quadratic form

(1) $(x,Ax) = \sum_{i,j=1}^{n} a_{ij} x_i x_j \qquad (a_{ij} = a_{ji})$

is assumed to have the determinant $D(A)$ and the minimum $M(A)$ (if $x \neq 0$ runs through all vectors with integer components). Let the vectors l_k be the only ones for which it is

(2) $(l_k, Al_k) = M(A)$.

The point $a_{11}, a_{22}, \ldots, a_{nn}, a_{12}, a_{13}, \ldots, a_{n-1\,n}$) of the $v = \frac{n}{2}(n+1)$ - dimensional space corresponds to the form (x,Ax). Let $\mathcal{P}$ be the set of points which corresponds to the

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On Perfect Forms With 6 Variables 39-44-2-8/10

positive-definite forms. According to Voronoy [Ref 1] a form of φ is called perfect, if it is completely determined by (2). Zolotarev [Ref 2] denotes a form of φ a limit form, if it corresponds to the point of the maximum of $\frac{M(A)}{\sqrt[n]{D(A)}}$. An algorithm for the determination of the different classes of equivalence of perfect forms in the cases n = 2,3,4,5 is due to Voronoy [Ref 1] . For these n the perfect forms were identical with the limit forms. The author performs the algorithm of Voronoy for n = 6 and states that the perfect forms for n = 6 contain all the known classes of limit forms [$(x,P_i x)$, i = 1,2,3 - Zolotarev [Ref 2] , $(x,P_4 x)$ - Coxeter [Ref 4] , $(x,P_5 x)$ - Barnes [Ref 3] , M. Kneser [Ref 5]] and furthermore a new class of perfect forms which, however, are no longer limit forms - $(x,P_6 x)$. A series of further related results is given. There are 5 references, 2 of which are Soviet, 1 German, and 2 American.

SUBMITTED: September 10, 1956

AVAILABLE: Library of Congress

Card 2/2 1. Quadratic equations 2. Vector analysis 3. Integral functions

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001860220001-1"

VLADIMIROV, V. S., Doc Phys-Math Sci (diss) -- "On an integral-differential equation of particle transfer". Moscow, 1959. 8 pp (Math Ins, im V. A. Steklov, Acad Sci USSR), 160 copies (KL, No 22, 1959, 107)

V.S. VLADIMIROV

16(1),16(2) SOV/42-14-1-27/27

AUTHORS: Leonidov,K.S., and Rakova,E.S.

TITLE: New Publications on Applied Analysis and Numerical Mathematics (Novyye izdaniya po prikladnomu analizu i vychislitel'noy matematike)

PERIODICAL: Uspekhi matematicheskikh nauk,1959,Vol 14,Nr 1,pp 261-265(USSR)

ABSTRACT: It is stated that in the USSR there exists no periodical on numerical mathematics and similar domains. The papers of these domains chiefly appear in the serie. "Publications on Applied Analysis and Numerical Mathematics" (BPAVM) and in single collected volumes. The series BPAVM began in 1955 and until now it contained the following monographies: 1. G.S.Salekhov "Calculation of Series"; 2. A.N.Khovanskiy "Application of Continued Fractions in the Approximate Analysis"; 3. V.S.Ryaben'kiy, A.F.Filippov "Stability of Difference Equations"; 4. G.S.Khovanskiy "Nomograms"; 5. S.M.Nikol'skiy "Quadrature Formulas"; 6. M.A.Kartsev "Arithmetic Devices of Electronic Digit Apparata"; 7. Yu.V. Vorob'yev "Momentum Method in Applied Mathematics"; 8. Ye.A. Zhogolev, G.S.Roslyakov, N.P.Trifonov, M.R.Shura-Bura "System of Standard-Subprograms".
There appeared the following collected volumes: "Numerical Mathematics and Computing Technics" (VMVT) since 1953,"Numerical Mathematics" (VM) since 1957, and "Computing Technics" (VT) since 1958. Until now two volumes of VMVT appeared with contributions of V.A.Ditkin, L.A.Lyusternik, A.I.Ivanova, A.A.Abramov, M.R. Shura-Bura, V.I.Shestakov, A.I.Vzorova, G.S.Khovanskiy, L.V. Mochek, Ye.N.Dekanosidze, L.N.Karamzina, V.K.Saul'yev, I.M. Itesin, M.A.Tomson, L.I.Gutenmakher, G.K.Kus'minok, L.S.Klabukova. The published three volumes of VM contained contributions of L.A.Lyusternik, Yu.V.Vorob'yev, Ye.A.Volkov, V.K.Saul'yev, I.M.Itesin, A.I.Vzorova, Ye.I.Al'tshuler, G.S.Khovanskiy, S.P. Kapitsa, M.R.Shura-Bura, F.I.Chekhkin, O.N.Katskova, Yu.D. Shmyglevskiy, V.S.Linskiy, [illegible] Rappoport, B.M.Drozdov, A.O.Gemes, V.S.Vladimirov, L.S.Klabukova, A.I.Vzorova, I.M.Sobol', V.K. Kabulov, O.M.Belotserkovskiy. The first volume of VT contains contributions of O.K.Shcherbakov, P.V.Mayorov, P.P.Golovistikov, Ye.A.Volkov, L.N.Korolev, N.Ya. Matyukhin, O.V.Kosnitskiy, Yu.N. Glukhov, Ye.I.Mamonov.
Besides in 1958 Yu.Ya.Bazilevskiy edited the collected volume "Questions of the Theory of Mathematical Machines" ("Voprosy teorii matematicheskikh mashin") with contributions of Yu.Ya. Bazilevskiy, I.Ya.Akushskiy, Yu.A.Shreyder, E.A.Glusberg, I.M. Vitenberg, B.I.Rameyev, V.S.Linskiy, L.A.Kosharskiy.

Card 3/3

66

[illegible]-66,919

S/155/59/000/02/035/036

AUTHORS: Bogolyubov, N.N., Vladimirov, V.S.

TITLE: Supplement to the Paper "A Theorem on the Analytic Continuation of Generalized Functions"

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1959, No. 2, p.179

TEXT: In (Ref. 1) it was shown that, if the Fourier transforms $\widetilde{F}_r(p)$ and $\widetilde{F}_a(p)$ of certain generalized functions $F_r(x)$ and $F_a(x)$ coincide in the domain

(1) $p_0^2 - p_1^2 - \dots - p_n^2 < m \quad (m \geqq 0)$,

then in (1) there holds the representation $\widetilde{F}_r(p) = \widetilde{F}_a(p) = \sum P_k(p)\,\phi_k(p_0^2 - p_1^2 - \dots - p_n^2)$, where the $\phi_k(\zeta)$ are continuable into the whole ζ - plane except the intersection

(3) $\operatorname{Im}\zeta = 0$, $\operatorname{Re}\zeta \geqslant m$.

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Supplement to the Paper "A Theorem on the Analytic Continuation of Generalized Functions" S/155/59/000/02/035/036

Now it is stated that (3) must be replaced by

(4) $\mathrm{Im}\,\zeta = 0, \quad \mathrm{Re}\,\zeta \geqslant 0,$

if $m < 0$.

There is 1 Soviet reference.

ASSOCIATION: Matematicheskiy institut imeni V.A. Steklova AN SSSR (Mathematical Institute imeni V.A. Steklov AS USSR)

SUBMITTED: April 15, 1959

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Card 2/2

16(1) SOV/38-23-2-8/10

AUTHOR: Vladimirov, V.S.

TITLE: On the Definition of the Domain of Analyticity (Ob opredelenii oblasti analitichnosti)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya matematicheskaya, 1959, Vol 23, Nr 2, pp 275 - 294 (USSR)

ABSTRACT: The paper has direct connection with the investigations of the dispersion relations of Bogolyubov /Ref 1,6,7/. The proof of these relations occurring in the theory of quantized fields leads to the analytic continuation of distributions into the complex domain. The author succeeds in improving partially the results of Bogolyubov referring to this. With methods and denotations from /Ref 1/ the following theorem is proved : Let four generalized functions of four vectors be given : $F_{lm}(x_1, x_2, x_3, x_4)$, $l,m = r,a$, $x_s = (x_{s0}, \vec{x}_s)$, $s = 1,2,3,4$, which satisfy the conditions $F_{rr} = 0$, if $x_1 \lesssim x_3$ or $x_2 \lesssim x_4$, $F_{ra} = 0$, if $x_1 \lesssim x_3$ or $x_2 \gtrsim x_4$, $F_{ar} = 0$ if $x_1 \gtrsim x_3$ or $x_2 \gtrsim x_4$ and $x_1 \gtrsim x_3$ or $x_2 \lesssim x_4$, $F_{aa} = 0$, if $x_1 \gtrsim x_3$ or $x_2 \gtrsim x_4$

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SOV/38-23-2-8/10

On the Definition of the Domain of Analyticity

which are invariant under the transformations of the inhomogeneous orthochronic Lorentz group. Let their Fourier transforms $\tilde{F}_{lm}(p_1, p_2, p_3, p_4)$ be defined on

(1) $p_1 + p_2 + p_3 + p_4 = 0$

and let : $\tilde{F}_{rm} = \tilde{F}_{am}$, if $p_1^2 < (M+1)^2$ and $p_3^2 < \gamma^3$ $(m = r,a)$; $\tilde{F}_{lr} = \tilde{F}_{la}$, if $p_2^2 < (M+1)^2$ and $p_4^2 < \gamma^2$ $(l = r,a)$; $\tilde{F}_{lm} = 0$, if $(p_1 + p_3)^2 < (M+1)^2$ or $p_{1o} + p_{3o} < 0$ $(l,m = r,a)$. Here let $\gamma > 1$, $M + 1 \geqslant \gamma$. Let V and τ_o be arbitrary fixed numbers, $V < \tau_o \leq 1$, $\tau_o > -1 - 2M$. Then it exists a sufficiently small number $\varrho > 0$ being independent on t, and a generalized function $\Phi(z_1, z_2, z_3, z_4, z_5, t)$ of the real variable t so that :

1.) Φ is holomorphic concerning $(z_1, \ldots, z_5)$ in

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On the Definition of the Domain of Analyticity SOV/38-23-2-8/10

(2) $|z_1 - M^2| < \varrho$ $|z_2 - M^2| < \varrho$, $|z_3 - \tau| < \varrho$, $|z_4 - \tau| < \varrho$,

$|z_5 + 4\Delta^2| < \frac{\varrho}{t^2}$, where $\nu \leqslant \tau \leqslant \tau_0$, $0 \leqslant \Delta^2 < \Delta^2_m$,

$\Delta^2_m = \gamma\left(1 - \frac{1 - \tau}{2M + 2}\varrho\right) - \tau_0$,

2.) $\phi = 0$ for $t < \frac{1}{2}(M + 1)$

3.) for real (p_1, p_2, p_3, p_4) from (1), for which $z_1 = p_1^2$, $z_2 = p_2^2$, $z_3 = p_3^2$, $z_4 = p_4^2$, $z_5 = (p_1 + p_2)^2$ for all $t^2 = \frac{1}{4}(p_1 + p_3)^2 \geqslant \frac{1}{4}(M + 1)^2$ belong to the domain (2), and for which $p_{1o} + p_{3o} \geqslant 0$ there holds the representation :

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$$\tilde{F}_{lm}(p_1, p_2, p_3, p_4) = \phi\left[p_1^2, p_2^2, p_3^2, p_4^2, (p_1 + p_2)^2; \tfrac{1}{2}\sqrt{(p_1+p_3)^2}\right],$$

$$l, m = r, a .$$

The author thanks N.N. Bogolyubov and A.A. Logunov for the discussion of the paper.
There are 10 references, 7 of which are Soviet, 1 American, 1 French, and 1 Italian.

PRESENTED: by N.N. Bogolyubov, Academician

SUBMITTED: March 26, 1958

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16.8100

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SOV/38-23-5-3/8

~~16(1)~~

AUTHORS: Vladimirov, V.S., Logunov, A.A.

TITLE: On Analytic Properties of Generalized Functions of Quantum Field Theory

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya matematicheskaya, 1959, Vol 23, Nr 5, pp 661 - 676 (USSR)

ABSTRACT: The authors prove the following generalization of a well-known theorem of Bogolyubov :
Fundamental theorem : Let four translation-invariant functions of 4 four-dimensional vectors

$$F_{ij}(x_1, x_2, x_3, x_4) \qquad i,j = r, a$$

be given with the following properties :
a.) F_{ij} are invariant with respect to the transformations of the complete Lorenz group
b.) F_{ij} satisfy the causality conditions

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SOV/38-23-5-3/8

On Analytic Properties of Generalized Functions of Quantum Field Theory

$$F_{rr} = 0 \quad \text{if} \quad x_1 \lesssim x_3 \quad \text{or} \quad x_2 \lesssim x_4$$

$$F_{ra} = 0 \quad \text{if} \quad x_1 \lesssim x_3 \quad \text{or} \quad x_2 \gtrsim x_4$$

$$F_{ar} = 0 \quad \text{if} \quad x_1 \gtrsim x_3 \quad \text{or} \quad x_2 \lesssim x_4$$

$$F_{aa} = 0 \quad \text{if} \quad x_1 \gtrsim x_3 \quad \text{or} \quad x_2 \gtrsim x_4$$

c.) the following spectral conditions are satisfied

$$\tilde{F}_{rj} = \tilde{F}_{aj} \quad \text{if} \quad p_1^2 < (M+\mu)^2 \ , \ p_3^2 < \gamma_1^2 \mu^2 \qquad j = r,a$$

$$\tilde{F}_{ir} = \tilde{F}_{ia} \quad \text{if} \quad p_2^2 < (M+\mu)^2 \ , \ p_4^2 < \gamma_2^2 \mu^2 \qquad i = r,a$$

$$\tilde{F}_{ij} = 0 \quad \text{if} \quad (p_1 + p_3)^2 < (M+\mu)^2 \quad \text{or} \quad p_{1o} + p_{3o} < 0$$

where $\tilde{f}(p) = \tilde{f}(p_1,p_2,p_3,p_4)$ is the Fourier transform of

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SOV/38-23-5-3/8

On Analytic Properties of Generalized Functions of Quantum Field Theory

$f(x) = f(x_1, x_2, x_3, x_4)$, $\gamma_j > 1$, $M + \mu \geqslant \gamma_j$, $\mu > 0$, $j = 1,2$

Then a function $\phi(z_1, z_2, z_3, z_4, z_5; t)$ with the following properties can be constructed :

1.) ϕ is a generalized function of the real variable t and vanishes for $t < \frac{1}{2}(M + \mu) = t_0$

2.) ϕ is holomorphic in D_t with respect to $z = (z_1, \ldots, z_5)$ for $t \geqslant t_0$. D_t contains all points

$$(1.2) \quad z_1 = M^2,\ z_2 = M^2,\ z_3 = \tau + \tau_1^0,\ z_4 = \tau + \tau_2^0,$$
$$z_5 = -4\Delta^2,$$

where τ is arbitrary real $\leqslant 0$ and Δ^2 runs through the interior of the ellipse

$$(1.3) \quad A(t,\tau) + B(t,\tau)\cos\delta + i\,C(t,\tau)\sin\delta,\ 0 \leqslant \delta \leqslant 2\pi.$$

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On Analytic Properties of Generalized Functions of Quantum Field Theory SOV/38-23-5-3/8

Here it is

$$A(t,\tau) = \frac{1}{4}\varphi^2(t,\tau+\tau_1^0) + \frac{1}{4}\varphi^2(t,\tau+\tau_2^0) - \left(\frac{\tau_1^0-\tau_2^0}{8t}\right)^2$$

$$B(t,\tau) = \frac{1}{2}\psi(t,\gamma_1,\tau+\tau_1^0)\,\psi(t,\gamma_2,\tau+\tau_2^0) + \frac{1}{2}\sqrt{\psi^2(t,\gamma_1,\tau+\tau_1^0) - \varphi^2(t,\tau+\tau_1^0)}\cdot\sqrt{\psi^2(t,\gamma_2,\tau+\tau_2^0) - \varphi^2(t,\tau+\tau_2^0)}$$

$$C(t,\tau) = \frac{1}{2}\psi(t,\gamma_1,\tau+\tau_1^0)\sqrt{\psi^2(t,\gamma_2,\tau+\tau_2^0) - \varphi^2(t,\tau+\tau_2^0)} + \frac{1}{2}\psi(t,\gamma_2,\tau+\tau_2^0)\sqrt{\psi^2(t,\gamma_1,\tau+\tau_1^0) - \varphi^2(t,\tau+\tau_1^0)},$$

where

$$\varphi^2(t,\tau) = \left(t + \frac{M^2-\tau}{4t}\right)^2 - M^2 \tag{1.4}$$

and

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On Analytic Properties of Generalized Functions of Quantum Field Theory

$$(1.5)\quad \psi(t,\gamma,\tau) = \sqrt{\varphi^2(t,\tau) + \frac{(2M+\mu)(\gamma^2\mu^2-\tau)}{4t^2-(M+\mu-\gamma\mu)^2}\mu} \quad \text{if}$$

$$\tau \geqslant \gamma\mu\left(M+\mu-\frac{4t^2}{M+\mu-\gamma\mu}\right) = \frac{(2M+\mu)\mu}{4t} + \frac{1}{4t}\sqrt{(2t+M+\mu)^2-\tau}\cdot$$

$$\cdot\sqrt{(2t-M-\mu)^2-\tau} \quad \text{if}$$

$$\tau \leqslant \gamma\mu\left(M+\mu-\frac{4t^2}{M+\mu-\gamma\mu}\right).$$

The numbers $M, \mu, \gamma_j, \tau_j^0$ are chosen so that $\psi > 0$ for $\tau \leqslant 0,\ t \geqslant t_0$.

3.) For real (p_1,p_2,p_3,p_4) from (1.1) $p_1+p_2+p_3+p_4 = 0$, for which the magnitudes $z_1 = p_1^2,\ z_2 = p_2^2,\ z_3 = p_3^2,$

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On Analytic Properties of Generalized Functions of Quantum Field Theory SOV/38-23-5-3/8

$z_4 = p_4^2$, $z_5 = (p_1 + p_2)^2$ belong to $D_{\pm}$, there holds the representation $\tilde{F}_{ij}(p_1,\ldots,p_4) =$

$$= \phi\left[p_1^2,\ p_2^2,\ p_3^2\ ,\ p_4^2\ ,\ (p_1 + p_2)^2\ ,\ \frac{1}{2}\sqrt{(p_1 + p_3)^2}\right],$$

$i,j = r,a$, for $t = \frac{1}{2}\sqrt{(p_1+ p_3)^2} \geqslant t_o$ and $p_{1o} + p_{3o} \geqslant 0$.

Sobolev is mentioned in the paper. The authors use results of Jost, Lehman [Ref 20] and Dyson [Ref 12] . There are 21 references, 11 of which are Soviet, 4 American, 3 Italian, 1 French, 1 German, and 1 Swedish.

PRESENTED: by N.N. Bogolyubov, Academician

SUBMITTED: October 30, 1958

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VLADIMIROV, V.S.

PHASE I BOOK EXPLOITATION SOV/3981

Issledovaniya po sovremennym problemam teorii funktsiy kompleksnogo peremennogo; sbornik statey (Investigation of Modern Problems in the Theory of Complex Variables; Collection of Articles) Moscow, Fizmatgiz, 1960. 5[illegible] p. 3,000 copies printed.

Ed. (Title page): A. I. Markushevich; Eds. (Inside book): V. S. Vladimirov and S. Ya. Khavinson; Tech. Ed.: N. Ya. Murasheva.

PURPOSE: This book is intended for specialists in the theory of functions of a complex variable. It may also be used by advanced [illegible], scientific workers, and specialists in other fields of [illegible].

COVERAGE: The book contains 48 papers originally read at the Third [illegible] Conference on the Theory of Functions of a Complex Variable held at [illegible] University from May 28 to June 4 1957. The articles treat [illegible] in the modern theory of functions and its applications. The book is divided into 7 parts. The first part discusses the problem of [illegible], [illegible] series, boundary and extremal properties. The second part discusses entire functions and interpolation and approximation problems. The third part discusses functions of many complex variables. The fourth part discusses conformal mappings and boundary-value problems. The fifth part discusses [illegible] and the theory of distribution of values. The sixth part [illegible], and the seventh part discusses [illegible]

AVAILABLE: Library of Congress

Card 9/9

AC/[illegible]/fal
7-15-60

VLADIMIROV, V. S.

"Primenenye metodov teorii funkeyi mnogih komplexsnyh peremyenyh k differencyalnmy uraynenyam."

Report submitted for the Conference on Functional Analysis, Warsaw, 4-10 Sep 60

35851
S/044/62/000/002/039/092
C111/C444

16.4500
24.6712

AUTHOR: Vladimirov, V. S.

TITLE: On some variational principles for the integro-differential equation of the transmission of particles

PERIODICAL: Referativnyy zhurnal, Matematika, no. 2, 1962, 72, abstract 2B315. ("Tr. Vses. soveshchaniya po differents. urav-niyam, 1958," Yerevan, AN ArmSSR, 1960, 47-54)

TEXT: Considered is the integro-differential equation

$$L\varphi - \lambda S\varphi = (s, \alpha^{-1} \operatorname{grad} \varphi) + \varphi - \frac{\lambda}{2\pi} \int_{\Omega} \theta(P, \mu_0) \varphi(s', P)\, ds' = F(s, P), \qquad \mu_0 = (s, s') . \tag{1}$$

Here Ω indicates the unit sphere of the three-dimensional space, s and s' are unit vectors, the point $P(x_1, x_2, x_3)$ runs through a

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On some variational principles . . .

finite domain G with the piecewise smooth boundary Γ ; the function $\alpha = \alpha(P)$ is measurable and $0 < \alpha(P) \leqslant \alpha_0$ = const. The boundary condition is

$$\varphi(s, P) = 0; \quad P \in \Gamma, \quad (s, n) < 0 \qquad (2)$$

n being the exterior normal of Γ. With respect to the kernel $\theta(P, \mu_0)$ the following suppositions are set up:

1.) it is measurable on $G \times (-1, 1)$ and there exists a sequence of bounded functions $\theta_k(P, \mu_0)$, $k = 1, 2, \ldots$, being measurable on $G \times (-1, 1)$ such that

$$\int_{-1}^{1} \left| \theta(P, \mu_0) - \theta_k(P, \mu_0) \right| d\mu_0 \underset{k \to \infty}{\to} 0$$

uniformly with respect to $P \in G$.

2.) $\theta(P, \mu_0) = \theta(P, -\mu_0) \neq 0$ almost everywhere in $G \times (-1, 1)$.

3.) in G there holds

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On some variational principles . . .

$$\int_{-1}^{1} \vartheta(P, \mu_0)\, P_k(\mu_0)\, d\mu_0 \geq 0,$$

where P_k are Legendre polynomials. With respect to the right hand of (1) one supposes that $F \in H = L_2\,(\Omega \times G, \alpha(P))$. Some properties of the equation (1) are given. Thus it holds: $L^* = ULU$, the operator U being defined by the formula $Uf(s, P) = f(-s,P)$; the operator S is positive, the operator $L^{-1}S$ is compact in H and symmetrisable from the left by the operator S. The eigenvalues λ_k of $L^{-1}S$ are positive; if φ_k are its eigenfunctions, then the system $S\varphi_k$ is complete in the range of S.

Further the equation $L_o u - \lambda Su = F(s, P)$, where $L_o = -(s, \alpha^{-1} \text{grad})^2 + 1$ with the boundary condition

$$u - (s, \alpha^{-1} \text{ grad } u) = 0; \quad P \in \Gamma, \ (s, n) < 0 \qquad (3)$$
$$u + (s, \alpha^{-1} \text{ grad } u) = 0, \quad P \in \Gamma, \ (s, n) > 0$$

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is considered.

If the free term is such that $F = UF$, then the solutions of (1) are connected by the relations

$$u = \frac{1}{2} (U\varphi + \varphi), \quad (s, \alpha^{-1} \operatorname{grad} u) = \frac{1}{2} (U\varphi - \varphi)$$

under the conditions (2) and (3), especially the eigenvalues of the two problems are identical, where as the eigenfunctions are connected by the relation above. The operator L_o is positively definite. According to Friedrichs one may introduce the space H_o with the metric $[u, v] = (L_o u, v)$. For the eigenvalues λ_k one formulates a variational principle which by the way is a sequence of well-known theorems. It is mentioned that the conditions (3) are natural. Several considerations on the application of spherical harmonics to the approximative solution of (1), and on the applicability of the Bubnov-Galerkin method are carried out.

[Abstracter's note: Complete translation.]

VLADIMIROV, V.S.

Double spectral representation of Feynman amplitude for a diagram of the fourth order. Ukr. mat. zhur. 12 no.12:132-146 '60. (MIRA 13:10)

(Functional analysis)

S/042/60/015/04/03/007
C111/C222 82227

16.2800

AUTHOR: Vladimirov, V.S. 16

TITLE: On Approximative Calculation of Wiener Integrals

PERIODICAL: Uspekhi matematicheskikh nauk, 1960, Vol. 15, No. 4, pp. 129 - 135

TEXT: The author considers the Wiener integral

$$(1) \qquad I = \int_C F(x)d_w x \quad ,$$

where C is the space of continuous functions x(t) defined on (0,1), x(0)=0. An approximating formula for the numerical calculation of (1) is sought in the form

$$(14) \qquad \int_C F(x)d_w x \approx \sum_{k=-\infty}^{\infty} \lambda_k F(x_k) \quad ,$$

where λ_k and $x_k(t)$ are chosen so that in the following cases (14) changes

X

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On Approximative Calculation of Wiener Integrals

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to a strong equation: 1) for all odd functionals $F(x) = - F(-x)$, 2) for functionals

$$(4) \quad F(x) = K_0 + \sum_{\nu=1}^{3} \int_0^1 \ldots \int_0^1 x(t_1) \ldots x(t_\nu) d^\nu_{t_1 \ldots t_\nu} K_\nu (t_1, \ldots, t_\nu)$$

where K_ν are arbitrary functions of bounded variation, 3) for functionals

$$(12) \quad F(x) = \|x\|^2 \int_0^1 \int_0^1 x(t_1)x(t_2)d^2_{t_1,t_2} \sigma(t_1,t_2) ,$$

where σ is of bounded variation and

$$(13) \quad \|x\|^2 = \int_0^1 x^2(t)dt .$$

It is stated that these claims are satisfied if

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On Approximative Calculation of Wiener Integrals S/042/60/015/04/03/007
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(28) $\lambda_k = \dfrac{4}{\pi^2(2k-1)^2 + 16}$, $x_k(t) = \sigma_k \alpha_k(t)$, $k = 1,2,\ldots$

(27) $\sigma_k = \sqrt{\dfrac{1}{4} + \dfrac{4}{\pi^2(2k-1)^2}}$,

(8) $\alpha_j(t) = \sqrt{2} \sin (j - \frac{1}{2}) \pi t$, $\lambda_o = 1 - 8 \sum\limits_{k=1}^{\infty} \dfrac{1}{\pi^2(2k-1)^2 + 16}$.

Theorem : Let the functional $F(x)$ given on C be continuous, i.e. from $\| x_n - x_o \| \to 0$ there follows $F(x_n) \to F(x_o)$. Let exist a positive monotonely increasing function $H(n)$ so that

(37) $| F(x) | \leqslant H(\| x \|^2)$, $x \in C$ X

and

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(38) $\int_C H(\varrho + \|x\|^2)\, d_w x < \infty$

for a certain $\varrho > \frac{1}{4}$. Then it holds

(39) $\lim_{n \to \infty} I_n = \int_C F(x)\, d_w x$.

The author mentions N.N. Bogolyubov, D.V. Shirkov, I.M. Gel'fand and A.M. Yaglom.

There are 7 references: 3 Soviet, 3 American and 1 Swedish.

SUBMITTED: February 10, 1959

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88202

16.5600

S/020/60/134/002/027/041XX
C 111/ C 333

AUTHOR: Vladimirov, V. S.

TITLE: Construction of Holomorphism Hulls for a Special Kind of Region

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 2, pp. 251-254

TEXT: Let R^{n+1} be the real space of the points $x = (x_o, x_1, \ldots, x_n) = (x_o, \bar{x})$; p, q its points; $C^{n+1} = R^{n+1} + i R^{n+1}$ the space of the p + iq; $\xi x = \xi_o x_o - \bar{\xi} \bar{x}$, $\bar{\xi} \bar{x} = \sum_{1 \le j \le n} \xi_j x_j$, $x^2 = x_o^2 - \bar{x}^2$; $|\bar{x}| = \sqrt{\bar{x}^2}$, $|x| = \sqrt{x_o^2 + \bar{x}^2}$. Assume that Γ^+ and Γ^- are the cone of light to come $(x_o > |\bar{x}|)$, and the gone cone of light $(x_o < -|\bar{x}|)$; $\Gamma = \Gamma^+ \cup \Gamma^-$. A smooth curve is called time-like, if its tangent vector belongs to Γ. A smooth surface is called space-like, if its normal belongs to Γ. The linear continuous functionals over the space S of Schwartz are called generalized functions. Assume that S^* is the space of the generalized functions, which is conjugate to S. The generalized functions $F^+(p)$ and $F^-(p)$ are called delayed or leading if their

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Construction of Holomorphism Hulls for a Special Kind of Region

Fourier transforms $\tilde{F}^+(x)$ and $\tilde{F}^-(x)$ vanish outside of $\bar{\Gamma}^+$ and $\bar{\Gamma}^-$ respectively; f(p) is called commutator, if $\tilde{f}(x) = 0$ for $x^2 < 0$. A holomorphic function $F(\zeta)$ in T^+ (or T^-) is said to belong to the class N^+ (or N^-), if 1.) for arbitrary $q \in \Gamma^+$ (or Γ^-), $\varepsilon > 0$, $t \geq t_0 > 0$ and a certain real l only depending on F it holds: $|F(p + itq)| < e(q, \varepsilon, t_0)\, e^{\varepsilon t}(1 + |p|)^l$; in S^* there exists the boundary value $F(p_0 + i\,0, \bar{p})$ (or $F(p_0 - i\,0, \bar{p})$) of the function $F(p + iq)$ for $q \to 0$, $q \in \Gamma^+$ (or Γ^-). Let $N = N^+ \cap N^-$. The function $F(\zeta)$ of the class N^+ (or N^-) is called analytic continuation of $F(p_0 + i\,0, \bar{p})$ (or $F(p_0 - i\,0, \bar{p})$. Assume that G is an open set in R^{n+1} and $\tilde{G}$ the complex neighborhood of G with the property that, if a sphere of radius η belongs to G, the corresponding complex sphere of radius 0.1η belongs to $\tilde{G}$.

Theorem 1: In order that a function $F(\zeta)$ holomorphic in $T \cup \tilde{G}$ of the class N exists, it is necessary and sufficient that its boundary values $F(p_0 + i\,0, \bar{p})$ and $F(p_0 - i\,0, \bar{p})$:

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Construction of Holomorphism Hulls for a Special Kind of Region

1.) are delayed and leading functions respectivlely, and 2.) coincide in G.

The domain $T \cup \tilde{G}$ in theorem 1 is not the holomorphy domain; F is holomorphic in the holomorphy hull $\mathcal{E}(T \cup \tilde{G})$. The domain , where $F(p_0 \pm i\,0, \bar{p})$ coincide, is the real section of a certain holomorphy domain.

Theorem 2: If the commutator f(p) vanishes in a domain G, then it also vanishes in the smallest convex hull $B_0(g)$ of the domain G with respect to the time-like curves.

Theorem 3: Every function $F(\zeta)$ of the class N which is holomorphic in $T \cup \tilde{G}$, where G is an arbitrary domain, is holomorphic in the domain $H(T \cup \tilde{G})$ which consists exactly of those points ζ for which every complex hyperboloid $(\zeta' - u)^2 = s$ (u, s real parameters), going through ζ, possesses at least one common interior point with G.

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Construction of Holomorphism Hulls for a Special Kind of Region

The author thanks N. N. Bogolyubov.

There are 14 references: 6 Soviet, 3 French, 4 American and 1 Italian.

ASSOCIATION: Matematicheskiy institut imeni V. A. Steklova Akademii nauk SSSR (Mathematical Institute imeni V. A. Steklov of the Academy of Sciences USSR)

PRESENTED: May 3, 1960, by N. N. Bogolyubov, Academician

SUBMITTED: April 27, 1960

83894

S/020/60/134/003/002/020
C111/C222

16.3500

AUTHOR: Vladimirov, V.S.

TITLE: Properties of Holomorphism Regions as Applied to the Study of Solutions of Differential Equations

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol.134, No.3, pp.511-513.

TEXT: The author uses the notations of his preceding paper (Ref.1). Every linear continuous functional over the space S of Schwartz is called a generalized function. In S^* the author considers the equation

$$(1) \qquad u(p) * f_o(p) = f(p), \quad f \in S^*, \quad f_o \in \theta_c' ,$$

where

$$(2) \qquad \tilde{f}(x) = 0, \quad \tilde{f}_o(x) \neq 0$$

for $x^2 = x_o^2 - \mathbf{x}^2 < 0$. Putting $f_o(p) = P\left(\frac{\partial}{\partial p_o}, \frac{\partial}{\partial p_1}, \ldots, \frac{\partial}{\partial p_n}\right)\delta(p)$,

then there follows that among the equations (1) there exist linear differential equations with constant coefficients

$$(3) \qquad P\left(\frac{\partial}{\partial p_o}, \frac{\partial}{\partial p_1}, \ldots, \frac{\partial}{\partial p_n}\right)u(p) = f(p)$$

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Properties of Holomorphism Regions as Applied to the Study of Solutions of Differential Equations

if $P(-ix_0, i\mathfrak{x}) \neq 0$ for $x^2 < 0$. From (Ref.1) there follows that every solution of (1) which belongs to S^* can be represented in the form

$$(7) \qquad u(p) = \lim_{\varepsilon \to +0} \left[F^+(p_0 + i\varepsilon, \mathfrak{p}) - F^-(p_0 - i\varepsilon, \mathfrak{p})\right],$$

where $F^{\pm}(\zeta)$ are two functions of the classes $N^{\pm}$ which are holomorphic in $T^{\pm}$. If $u(p)$ vanishes in G, then $F^{\pm}(\zeta) = F(\zeta)$ is a function of the class N holomorphic in $H(T \cup \tilde{G})$.

Theorem 1: Every solution of (1) belonging to S^* which vanishes in an arbitrary domain G can be represented as

$$(8) \qquad u(p) = F(p_0 + i0, \mathfrak{p}) - F(p_0 - i0, \mathfrak{p}).$$

Consequently this solution vanishes in the greater domain $B(G) = \mathrm{Re}_2 H(T \cup \tilde{G})$ which consists of those points p for which every hyperboloid $(p' - u)^2 = s$, $s \geqslant 0$, through p, with G has at least one common inner point.

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Properties of Holomorphism Regions as Applied to the Study of Solutions of Differential Equations

From the theorem there follows the correctness of the conjecture of Nirenberg (Ref.8) and the fact that for differential equations (3) the Cauchy initial values on surfaces of specially similar type cannot be prescribed arbitrarily.
There are 10 references: 3 Soviet, 3 French, 1 German, 2 American and 1 Swedish.

ASSOCIATION: Matematicheskiy institut im. V.A.Steklova Akademii nauk SSSR (Mathematical Institute im. V.A.Steklov of the Academy of Sciences of the USSR)

PRESENTED: May 6, 1960, by N.N.Bogolyubov, Academician

SUBMITTED: May 5, 1960

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86826

S/020/60/135/005/014/043
B019/B067

21.1100 (1033, 1420, 1590)

AUTHOR: Vladimirov, V. S.

TITLE: Boundary Conditions in the Method of Spherical Harmonic

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 5, pp. 1091-1094

TEXT: As is known, the method of spherical harmonic for the approximate solution of the kinetic equation

$(s, \frac{1}{\alpha}\,\mathrm{grad}\,\psi) + \psi = \frac{\lambda}{4\pi\Omega}\int \theta(P, \mu_0)\psi(s', P)ds' + F(s, P), \mu_0 = (s, s')$ (1) consists in writing an approximate solution as a sum of a finite number of spherical functions:

$$\sum_{0 \le k \le n}(2k+1)\sum_{-k \le i \le k}\frac{1}{1+\delta_{0i}}\frac{(k-|i|)!}{(k+|i|)!}\psi_{ki}(P)P_{ki}(s) \equiv \sum_{0 \le k \le n}(2k+1)\psi_k(s, P) \qquad (2)$$

Here, the coefficients $\psi_{ki}(P) = \psi_{ki}(x_1, x_2, x_3)$ are unknown, $P_{ki}(s) = P_{ki}(\theta, \psi)$ are linearly independent spherical functions of k-th order.

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Boundary Conditions in the Method of Spherical Harmonic

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To determine ψ_{ki}, a system of linear differential equations with partial derivatives is obtained which approximately holds for (1). Besides this system, approximate boundary conditions must exist which are close to the exact boundary conditions at the boundary between two media and at the vacuum boundary. The approximate boundary conditions at the boundary between two media may be clearly determined. They lead to the result that near these boundaries ψ_{ki} are steady. Difficulties arise in deriving the approximate boundary conditions at a boundary to the vacuum. These difficulties are dealt with in the present paper. The author assumes that the range G in which particle transportation takes place is enclosed by a piecewise smooth surface Γ. The exact boundary conditions which express the absence of particles impinging from outside then have the following form: $\psi(s,P) = 0$, if $P \in \Gamma$, and $(s, n) < 0$ (3), where n denotes the vector of the external normal in point P at the boundary Γ. An approximate solution of the homogeneous system (1) + (3) is determined in the form of the sum (2), where n is assumed to be 2m + 1. The boundary conditions are discussed for the diffusion approximation (m = 1), the problems of plane and spherical symmetry, and for an infinite cylinder. There are 8

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Boundary Conditions in the Method of Spherical Harmonic

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references: 4 Soviet, 2 US, and 1 British.

ASSOCIATION: Matematicheskiy institut im. V. A. Steklova Akademii nauk SSSR (Institute of Mathematics imeni V. A. Steklov of the Academy of Sciences USSR)

PRESENTED: July 2, 1960, N. N. Bogolyubov, Academician

SUBMITTED: June 29, 1960

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PHASE I BOOK EXPLOITATION SOV/5591

Vladimirov, V. S.

Matematicheskiye zadachi odnoskorostnoy teorii perenosa chastits (Mathematical Problems in the One-Velocity Particle Transport Theory) Moscow, Izd-vo AN SSSR, 1961. 157 p. (Series: Akademiya nauk SSSR. Matematicheskiy institut. Trudy, t. 61) 3,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR.

Resp. Ed.: I. G. Petrovskiy, Academician; Deputy Resp. Ed.: S. M. Nikol'skiy, Professor; Ed. of Publishing House: L. K. Nikolayeva; Tech. Eds.: T. A. Prusakova and O. M. Gus'kova.

PURPOSE: This book is intended for physicists and other professional workers concerned with nuclear reactors, geophysics, and astrophysics.

COVERAGE: The author discusses the new class of mathematico-physical equations, viz., the kinetic or transport equations that describe the process of transport or diffusion of neutrons in matter, especially in relation to calculations of nuclear reactors. A discussion of the process taking place in a reactor is included. A mathematical theory, based on the above-mentioned equations, is

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developed which purportedly helps to explain certain known facts, substantiate different approximate methods, and establish some new principles which enable the effective solution of the discussed problems. Except for the chapter on "Investigation of Equations for Spherical-Harmonics Methods", the principal results contained in this book were published in the author's earlier works (listed in Bibliography). He thanks N. N. Bogolyubov, G. I. Marchuk, and Ye. S. Kuznetsov. There are 92 references: 56 Soviet (2 translations), 32 English, 3 French, and 1 German.

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S/558/61/000/007/003/008
D299/D301

AUTHOR: Vladimirov, V.S.

TITLE: On variational methods for the approximate solution of the transport equation

SOURCE: Akademiya nauk SSSR. Vychislitel'nyy tsentr. Vychislitel'naya matematika, no. 7, 1961, 95 - 114

TEXT: Stationary transport-processes of particles are described by linear integro-differential equations of type

$$\frac{1}{\alpha(P)}(x, \operatorname{grad} \Psi) + \Psi = \frac{\lambda}{4\pi} h(P) \int_{\Omega} \theta(P, \mu_0)\, \Psi(s', P) ds' + F(s, P),$$
$$\mu_0 = (s, s'). \qquad (1)$$

If the region G, in which the transport takes place is finite and convex, and its boundary Γ - a piecewise-linear surface, then Eq. (1) is joined by the following boundary conditions:

$$\Psi(s, P) = 0 \text{ if } (s, n_P) < 0, \; P \in \Gamma \qquad (2)$$

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where n_P denotes the unit vector of the outer normal at the point P of Γ, and the unknown function Ψ (s, P) characterizes the density of particles, moving from P in the direction s. Eqs. (1) and (2) are called problem (1)-(2), which can be solved by approximate methods only. The author considers approximate methods which are based on the variational principle, set forth by him in 2 earlier works. This principle makes it possible to relate the boundary conditions to the method of spherical harmonics, found empirically by R.E. Marshak (Ref. 3: Note on the Spherical Harmonic Method as Applied to the Miln Problem for a Sphere. Phys. Rev., 71, 1947, 443-446); the variational principle is also used to prove the convergence of the Bubnov-Galerkin method. Problem (1)-(2) is written in operator form

$$L \Psi = \lambda S \Psi + F; \quad (8)$$

the corresponding homogeneous equation is

$$L \Psi = \lambda S \Psi. \quad (9)$$

The problem is reformulated: Find a function Ψ of D, which satis-

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fies Eq. (8) almost everywhere in $\Omega \times G$; for Eq. (9), the problem consists in finding the eigenvalues λ, for which Eq. (9) has non-trivial solutions in D. The properties of the solutions of the posed problem are considered. The variational principles are set forth. In order to solve (Eq. 8), it is sufficient to solve the self-conjugated equation

$$L_o u = \lambda S u + F \tag{19}$$

by the variational principles. The Hilbert space $\mathfrak{H}_0$, which is a closure of D_0, is considered. The solution u of Eq. (19) minimizes the functional

$$G(u) = [u]^2 - \lambda(u, Su) - 2(u, F) \tag{25}$$

in $\mathfrak{H}_0$. Two particular cases are discussed: The problem with spherical symmetry, and that with cylindrical symmetry. Further, the diffusion approximation is considered. By means of the variational principle, the differential (diffusion) equation is derived:

$$-\frac{1}{3\alpha(P)} \sum_{i=1}^{3} \frac{\partial}{\partial x_i} \frac{1}{\alpha(P)} \frac{\partial \Psi_o(P)}{\partial x_i} + \Psi_o(P) = h(P)\Psi_o(P) + \frac{1}{4\pi}\int_{\Omega} F(s, P)ds, \tag{49}$$

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and the boundary condition

$$\frac{2}{3\alpha(P)} \frac{\partial \Psi_0(P)}{\partial n_P} + \Psi_0(P)\Big|_{P \in \Gamma} = 0 \qquad (50)$$

which the sought-for function Ψ_0 has to satisfy. For this it is necessary that $\Psi_0(P)$ should minimize the functional $G(u)$, (among all the functions u of Ω_0, which do not depend on s). Condition (50) expresses the absence of particle inflow into the region G through the boundary Γ. By means of the variational principle it was possible to remove the arbitrariness in selecting the boundary condition within the framework of the diffusion approximation. Further, the spherical-harmonic method is set forth, as applied to the problem with plane-parallel symmetry. In the following, the convergence is proved of the Bubnov-Galerkin method, as applied to Eq. (19); with $\lambda < \lambda_1$, the Bubnov-Galerkin method reduces to the Ritz method. Finally, two examples are considered, illustrating the method. There are 2 tables and 16 references: 10 Soviet-bloc and 6 non-Soviet-bloc. The 4 most recent references to the English-language publica-

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